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(71) Applicant (*for all designated States except US*): **SIT LA PRECISA S.P.A.** [IT/IT]; Viale dell'Industria, 31/33, I-35129 Padova (IT).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **VERONESE, Giuseppe** [IT/IT]; Via Cataio, 29, I-35036 Montegrotto Terme (IT). **CHIORLIN, Alessandro** [IT/IT]; Via Leonardo da Vinci, 8, I-35020 Tribano (IT).

(74) Agents: **FABRIS, Stefano** et al.; Cantaluppi & Partners S.R.L., Via Matteotti, 26, I-35137 Padova (IT).

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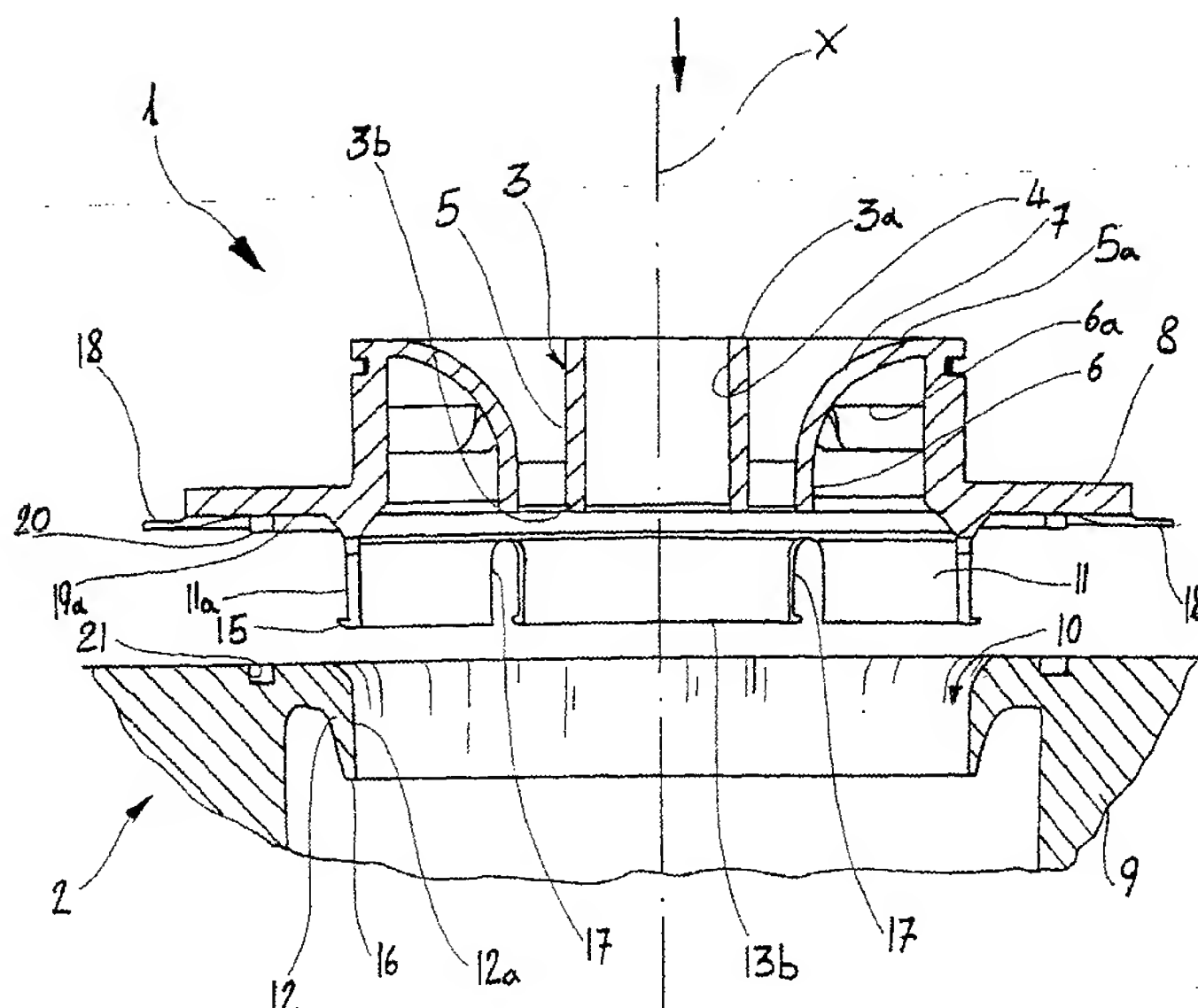
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(54) Title: A SYSTEM FOR CONNECTING AN AIR-GAS MIXING DEVICE TO A FAN, PARTICULARLY FOR GAS BOILERS AND SIMILAR APPARATUS



(57) Abstract: A system for connecting an air-gas mixing device (1) to a fan (2), in which an output section (3b) of the mixer (1) is connected, in flow communication, to an intake opening (10) of the fan (2) is described and comprises a first plug/socket coupling element and a second plug/socket coupling element (11, 12) which are provided on the mixer (1) and on the fan (2) respectively, and can be engaged in one another coaxially, and axial restraining means (15, 16) between the elements (11, 12), for the axial restraint of the mixer (1) relative to the fan (2).



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A system for connecting an air-gas mixing device to a fan, particularly for gas boilers and similar apparatus

#### Technical field

The present invention relates to a system for connecting an air-gas mixing  
5 device to a fan, according to the preamble to main Claim 1.

#### Technological background

In the technical field of the present invention, particularly in boilers and similar apparatus mainly for domestic use and comprising a gas burner, there is a need to connect the air-gas mixer device, which is designed and arranged to mix  
10 the combustible mixture in a suitable manner, to the inlet of a fan, typically a radial fan, for supplying the combustible mixture to the burner with forced ventilation.

In such applications, the air-gas mixer usually has a tubular output section to be connected to the intake opening of the fan in order to ensure flow communication as well as mechanical interlocking between these elements.

15 A known connection system provides for the output section of the mixer to be provided with a flange arranged for fixing by means of screws to a corresponding complementary flange, typically formed on the housing of the fan in the region of the intake opening.

Although this solution ensures interlocking, it renders the mounting of the  
20 mixer on the fan somewhat complex and, moreover, these elements have to be provided with respective connection-flanging surfaces.

Moreover, this connection system with screws or similar devices has not been found particularly quick during assembly and dismantling operations.

#### Description of the invention

25 The problem underlying the present invention is that of providing a system for connecting an air-gas mixing device to a fan or similar apparatus which is designed structurally and functionally to overcome the problems discussed with reference to the prior art mentioned.

This problem is solved by the invention by means of a connection system  
30 formed in accordance with the appended claims.

#### Brief description of the drawings

The characteristics and the advantages of the invention will become clearer from the following detailed description of a preferred but not exclusive

embodiment thereof, described by way of non-limiting example with reference to the appended drawings, in which:

- Figure 1 is an axial section through a connection system according to the invention, in the disconnected condition,
- 5 - Figure 2 is a partial axial section through the system of Figure 1, in the coupled condition,
- Figure 3 is a front elevational view of the air-gas mixer of the preceding drawings, arranged for coupling to a fan by the connection system of the present invention, and
- 10 - Figure 4 is a plan view of the mixer of the preceding drawings.

#### Preferred embodiment of the invention

With reference to the drawings mentioned, an air-gas mixer, generally indicated 1, is arranged for connection to a fan 2, shown only partially, by a connection system formed in accordance with the present invention. The  
15 invention is for use in particular, but not exclusively, in the connection of air-gas mixers to fans in gas apparatus such as, for example, boilers with gas burners for domestic use.

The mixer 1 comprises a tubular body 3 having a longitudinal axis X, a first axial end 3a, and a second, opposite end 3b, the latter constituting the section for  
20 the output of the combustible air-gas mixture formed in the mixer.

The tubular body 3 defines, coaxially, a first axial duct 4 through which the gas is supplied and, outside the duct 4, a second duct 5 and a third duct 6, converging in the output section 3b. The ducts 5, 6 are separated by a wall 7 and have respective supply openings 5a, 6a through which corresponding air-flows are  
25 admitted to the mixer.

In the region of the output section 3b, the tubular body is enlarged to form a plate-shaped element 8 which extends radially therefrom and the function of which will become clear from the following description.

The fan 2 is a radial fan and is positioned downstream of the mixer 1. It  
30 comprises a housing 9 in which there is an intake opening 10, which is shown in Figure 1, and which is to be connected in flow communication with the output section 3b of the mixer 1.

The connection system comprises a first plug/socket coupling element and a second plug/socket coupling element which are provided on the mixer 1 and on the fan 2, respectively, extend coaxially along the axis X, and can be engaged in one another. The first element comprises a collar 11 projecting from the output  
5 section 3b of the mixer and the second element comprises a mouth portion 12 of the intake opening of the fan 2.

The outer surface of the collar 11 and the inner surface of the mouth portion 12, which are indicated 11a and 12a, respectively, have complementary profiles along at least a portion of their axial extent along the axis X, as shown in  
10 Figures 1 and 2.

The collar 11 is formed integrally with the tubular body of the mixer and is preferably made of a thermoplastic material.

An annular projection 15 extends radially at the free axial end 13b of the collar and can abut a respective annular surface 16 of the mouth portion 12, as  
15 will be explained in greater detail below, the projection 15 and the corresponding surface 16 thus together constituting means for the axial restraint of the mixer relative to the fan in an operative axial interlocking position (Figure 2).

The collar 11 is also resiliently contractible radially by virtue of the provision of several axial slots 17 constituting circumferential interruptions of the lateral wall  
20 of the collar (Figures 1 and 3). The profile 12a of the mouth portion can also interfere, in the above-mentioned plug/socket coupling, at least with the annular projection 15 of the collar 11 so that the collar is contracted resiliently to enable it to be inserted in the mouth portion 12 and consequently to snap back to the operative axial locking position. The plug/socket coupling of the connection  
25 system according to the invention is therefore a snap coupling. More particularly, the snap-coupling is substantially irreversible, that is, once the collar is engaged, it can be removed only with the aid of a tool which can contract the collar radially in order to disengage its annular projection 15 from the corresponding surface 16.

In a variant of the invention, not shown, the collar 11 is made of spring steel  
30 and is arranged to be snap-engaged on the tubular body 3 of the mixer.

The system according to the invention is also provided with resilient means for taking up the play in the axial coupling between the collar and the mouth portion. These means comprise one or more annular appendages 18 (three



appendages in the embodiment described) extending radially from the collar 11 in the region of its axial end remote from the projection 15. More particularly, the appendages 18 are formed integrally with the collar and project radially therefrom with a configuration substantially of sectors of a circular ring (arranged at angular intervals of 120°). In the disconnected condition of the mixer and the fan, the appendages 18 project beyond the lower profile of the plate-like element 8 in positions spaced (in the sectioned view of Figure 1) from the base surface 19a thereof.

This base surface 19a can be brought into abutment with a corresponding surface of the mouth portion 12 of the fan which faces it so that, as a result of the plug/socket coupling of the mixer on the fan, the appendages 18 are deformed resiliently, giving rise to a resilient force on the mixer tending to urge the annular projection 15 and the surface 16 into mutual contact. The appendages 18 thus constitute means for taking up axial play in the coupling between the collar and the mouth portion of the fan.

An annular projection projecting from the base surface 19a of the plate-like element 8 of the mixer is indicated 20. This projection can engage, with a substantial form fit, a respective annular groove 21 formed in the mouth portion 12 of the fan in a position facing the output section of the mixer. As well as facilitating the location of the mixer relative to the fan, the engagement of the projection 20 in the groove 21 serves to ensure their mutual restraint transverse the axis of the plug/socket coupling.

In use, the connection system provides for the collar 11 first of all to be coupled by being fitted (along the axis X) in the mouth portion 12 until the annular projection 15 (and the collar) is radially contracted owing to interference with the surface profile 12a of the mouth portion 12 in order then to snap back to the axial locking position in which the annular projection 15 is in abutment with the annular surface 16 of the mouth portion.

It will be noted that, in the axial restraint position, the mixer is not prevented from rotating about the axis X relative to the fan. As a result, the mixer can advantageously be oriented angularly relative to the intake opening of the fan to facilitate its mounting as well as its adjustment.

Conversely, in order to disconnect the mixer by disengagement of the projection 15 from the annular surface 16, the collar 11 is slipped out by being contracted resiliently in the mouth portion 12.

The invention thus solves the problem posed, achieving many advantages  
5 over known solutions.

These include rapid coupling between the mixer and the fan as well as structural simplicity of the coupling elements. Another advantage is that, in contrast with known solutions, neither the mixer nor the fan requires any provision for a connection, for example, a flanged connection with screw means. Moreover,  
10 the connection system of the invention does not require the use of any specific tightening tools, facilitating coupling and rendering it extremely quick. Not least is the advantage that axial locking with taking-up of the play in the coupling is ensured, enabling a precise connection of the mixer to the fan to be achieved, irrespective of the working tolerances with which the collar is produced.

## CLAIMS

1. A system for connecting an air-gas mixer device (1) to a fan (2) in which an output section (3b) of the mixer (1) is connected, in flow communication, to an intake opening (10) of the fan (2), characterized in that it comprises a first  
5 plug/socket coupling element and a second plug/socket coupling element (11, 12) which are provided on the mixer device (1) and on the fan (2), respectively, and can be engaged in one another coaxially, and axial restraining means (15, 16) between the elements (11, 12), for the axial restraint of the mixer (1) relative to the fan (2).
- 10 2. A connection system according to Claim 1 in which the plug/socket coupling is a snap-coupling.
3. A connection system according to Claim 1 or Claim 2 in which the plug/socket coupling elements comprise, respectively, a collar (11) projecting coaxially from the mixer (1) in the region of the output section (3b) and a mouth portion (12) of  
15 the fan (2), which have complementary profiles along at least a portion of their axial extent.
4. A connection system according to Claim 3 in which the axial restraining means comprise at least one annular projection (15) which extends from the collar (11) and can abut an annular surface (16) of the mouth portion (12) in an operative  
20 position of axial restraint of the mixer (1) relative to the fan (2).
5. A connection system according to Claim 4 in which at least the projection (15) of the collar (11) is resiliently contractible radially to permit insertion of the collar (11) in the mouth portion (12) and subsequent snap-return to the operative axial locking position.
- 25 6. A connection system according to one or more of Claims 3 to 5 in which the collar (11) is partially interrupted circumferentially by at least one axial slot (17) so as to be contractible radially.
7. A connection system according to one or more of Claims 4 to 6 in which the annular projection (15) extends radially from a free axial end of the collar (11).
- 30 8. A connection system according to one or more of Claims 3 to 7 in which means are provided for resiliently contracting the collar (11) radially during its plug/socket coupling in the mouth portion (12).



9. A connection system according to Claim 8 in which the means for the radial contraction of the collar comprise at least a portion of the profile of the mouth portion (12) of the fan (2).
10. A connection system according to one or more of Claims 3 to 9 in which  
5 resilient means (18) are provided for taking up the axial coupling play of the collar (11) in the operative axial locking position.
11. A connection system according to Claim 10 in which the resilient means comprise at least one appendage (18) which extends from the collar (11) and can be deformed resiliently as a result of the plug/socket coupling of the collar (11) in  
10 the mouth portion (12) of the fan (2) so as to give rise to a resilient force tending to urge the annular projection (15) into a position of abutment with the corresponding annular surface (16) of the mouth portion (12).
12. A connection system according to Claim 11 in which the at least one appendage (18) is integral with the collar (11).
13. A connection system according to Claim 11 or Claim 12 in which the at least  
15 one appendage (18) is configured as a sector of a circular ring extending at the end of the collar (11) remote from the projection (15).
14. A connection system according to one or more of Claims 3 to 13 in which the collar (11) is made of thermoplastic material.
15. A system according to one or more of Claims 3 to 14 in which the collar (11) is  
20 formed integrally with the mixer (1).

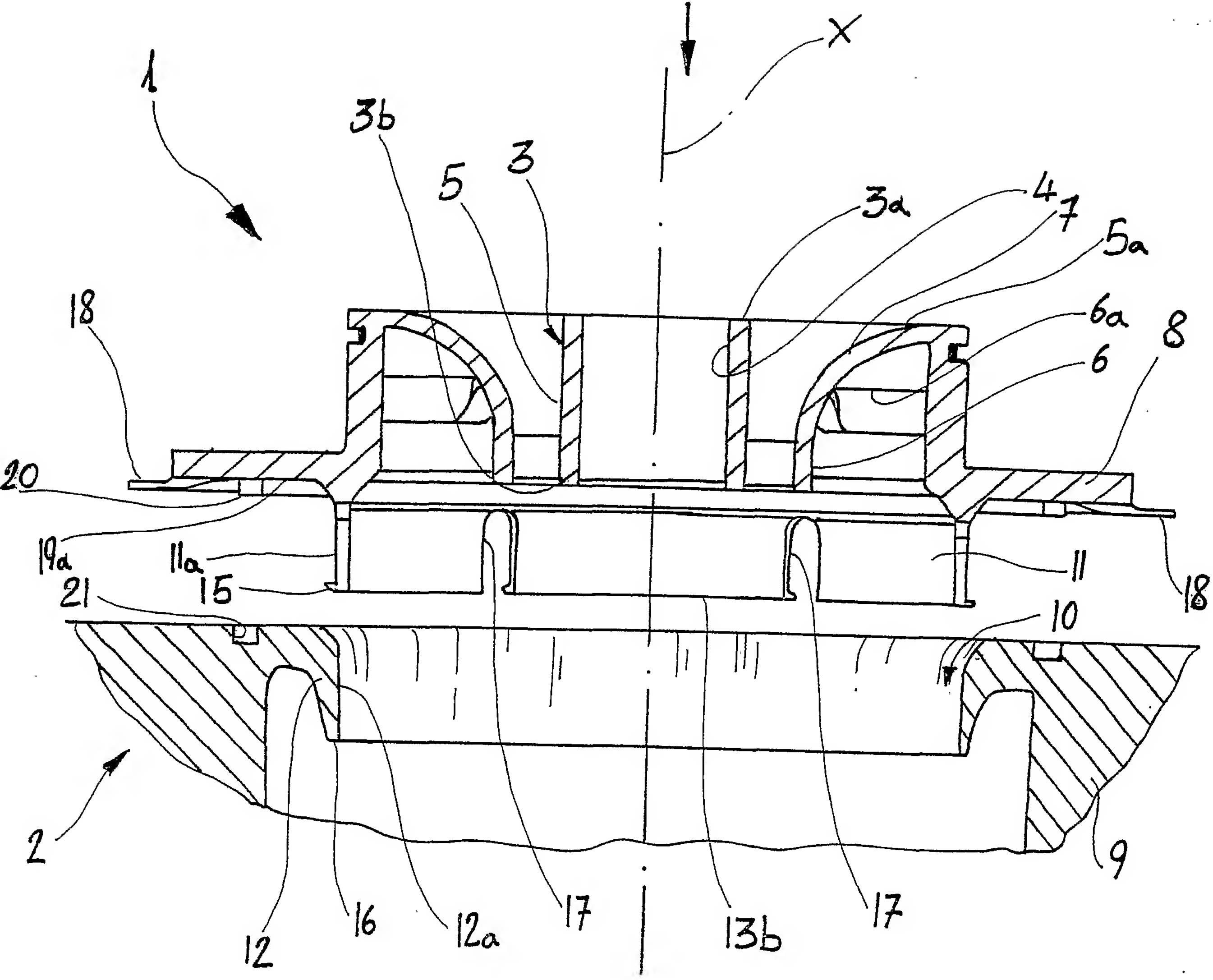
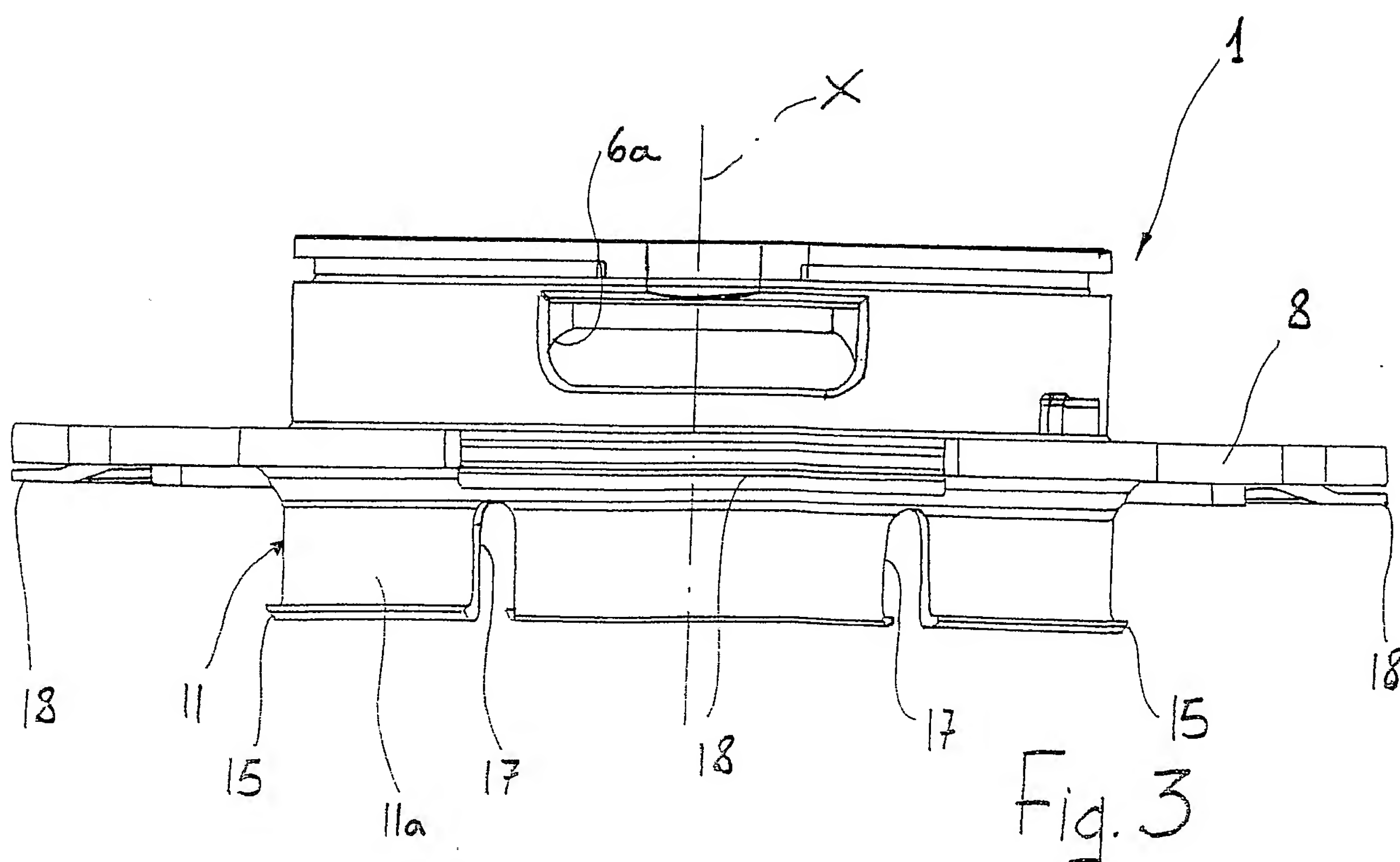
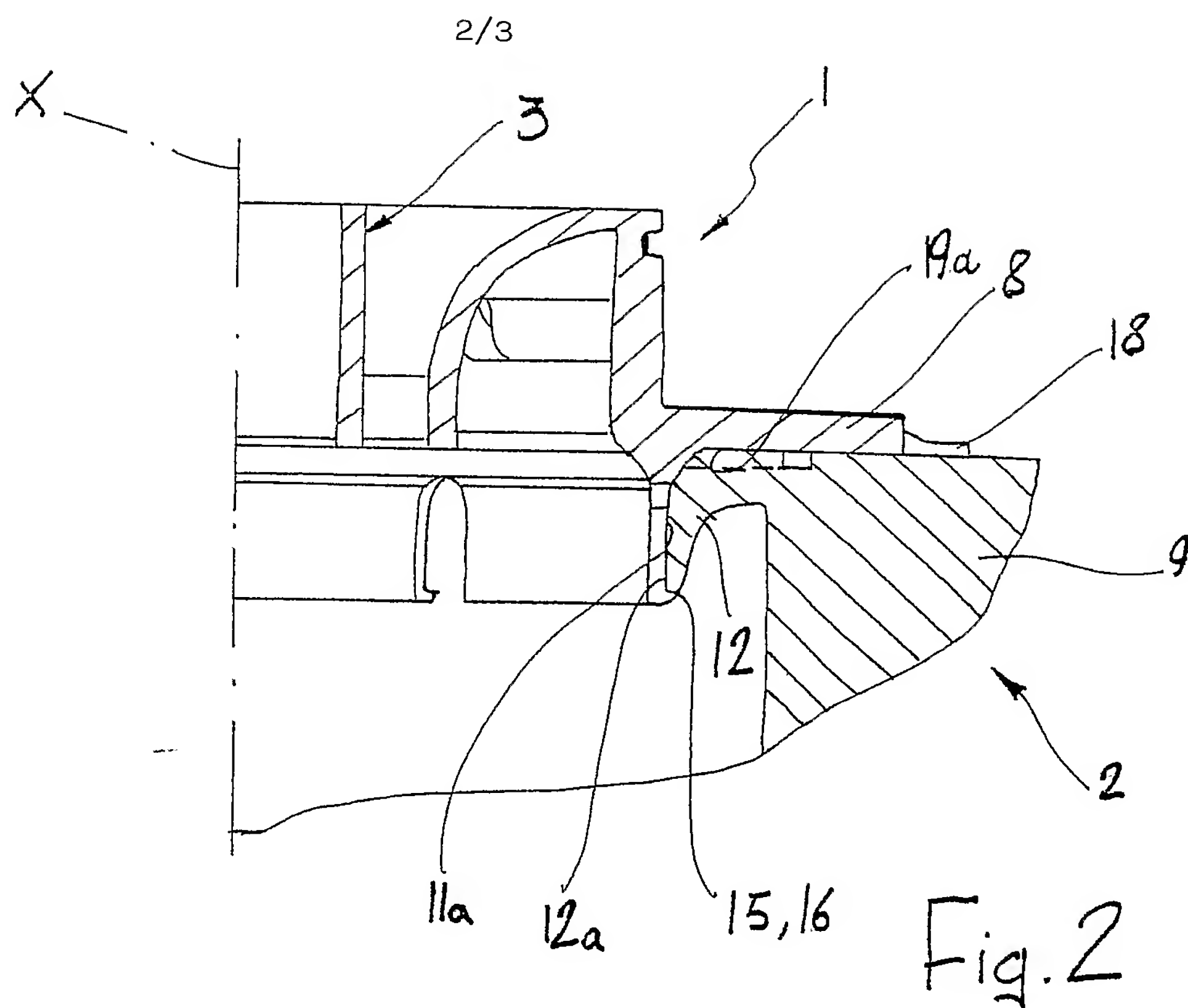
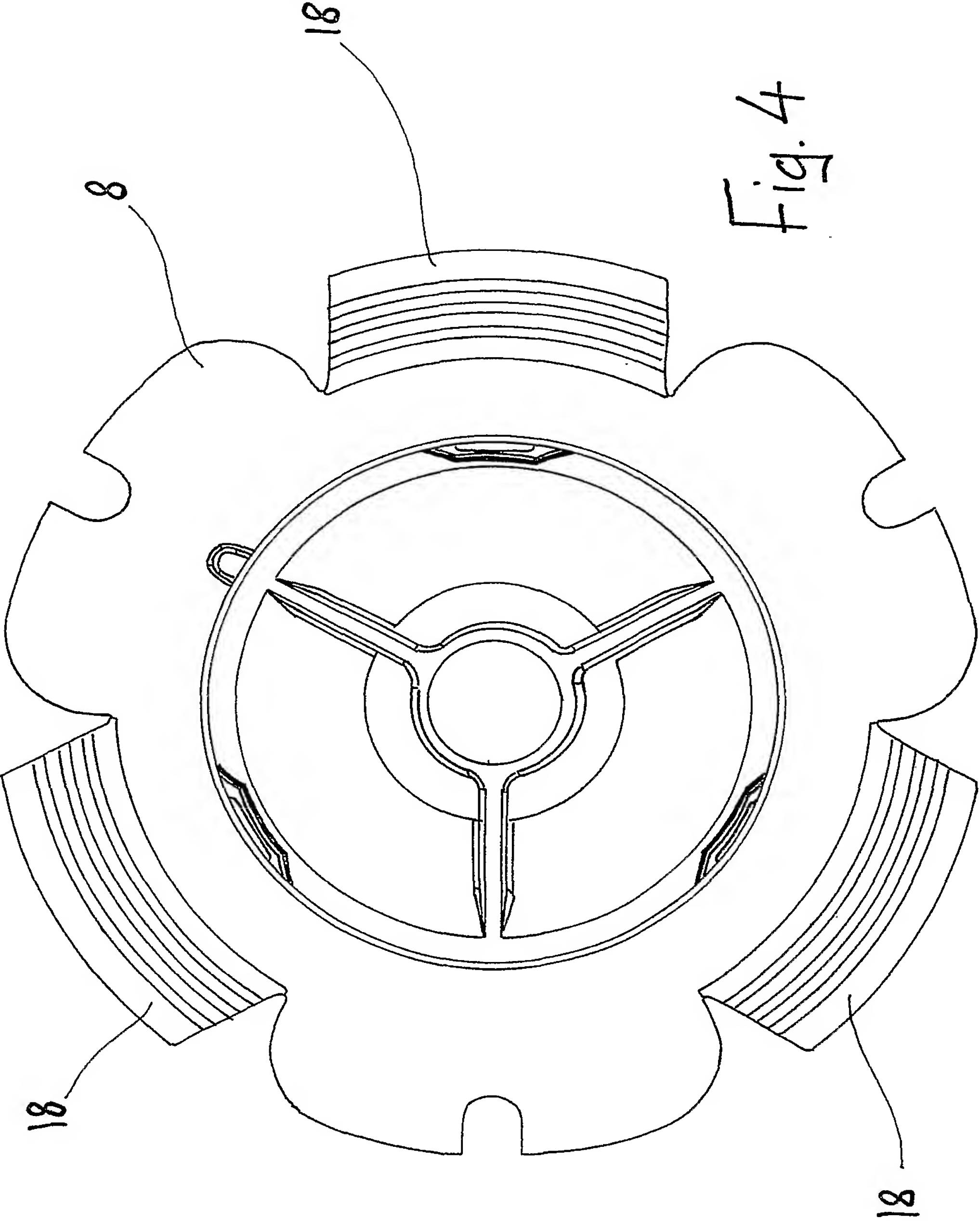


Fig. 1





## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 02/03003

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 F23D14/62

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F23D F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 86 03 628 U (EUROPLAST ROHRWERKE GMBH) 20 March 1986 (1986-03-20) page 3, line 5 -page 7, line 6; figures 1-3	1-5, 7-10
P, X	EP 1 099 906 A (BOSCH GMBH ROBERT) 16 May 2001 (2001-05-16) column 2, line 27 -column 4, line 4; figures 2-4	1, 3, 4
A	US 5 068 496 A (FAVALORA MARK L) 26 November 1991 (1991-11-26) column 2, line 55 -column 5, line 17; figures 1-6	1, 6
A	EP 0 846 916 A (SIT LA PRECISA SPA) 10 June 1998 (1998-06-10) the whole document	1
-/-		



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents:

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- \*&\* document member of the same patent family

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Theis, G



## INTERNATIONAL SEARCH REPORT

Int ☐ National Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 896 192 A (DUNGS KARL GMBH & CO) 10 February 1999 (1999-02-10) column 4, line 1 - line 26; figure 1 -----	1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

Int            nal Application No

PCT/EP 02/03003

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 8603628	U	20-03-1986	DE 8603628 U1	20-03-1986
EP 1099906	A	16-05-2001	DE 19954287 A1	21-06-2001
			CN 1298073 A	06-06-2001
			EP 1099906 A1	16-05-2001
US 5068496	A	26-11-1991	CA 2044086 A1	01-05-1992
EP 0846916	A	10-06-1998	IT PD960300 A1	08-06-1998
			DE 846916 T1	22-10-1998
			EP 0846916 A2	10-06-1998
EP 0896192	A	10-02-1999	DE 19733767 A1	11-02-1999
			EP 0896192 A2	10-02-1999

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AIR-GAS MIXING DEVICE TO A FAN,  
PARTICULARLY FOR GAS BOILERS  
AND SIMILAR APPARATUS

**PUBN-DATE:** October 3, 2002

**INVENTOR-INFORMATION:**

<b>NAME</b>	<b>COUNTRY</b>
VERONESE, GIUSEPPE	IT
CHIORLIN, ALESSANDRO	IT

**ASSIGNEE-INFORMATION:**

<b>NAME</b>	<b>COUNTRY</b>
SIT LA PRECISA SPA	IT
VERONESE GIUSEPPE	IT
CHIORLIN ALESSANDRO	IT

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F23D014/62 , F23L005/02

**ABSTRACT:**

CHG DATE=20031129 STATUS=O>A system for connecting an air-gas mixing device (1) to a fan (2), in which an output section (3b) of the mixer (1) is connected, in flow communication, to an intake opening (10) of the fan (2) is described and comprises a first plug/socket coupling element and a second plug/socket coupling element (11, 12) which are provided on the mixer (1) and on the fan (2) respectively, and can be engaged in one another coaxially, and axial restraining means (15, 16) between the elements (11, 12), for the axial restraint of the mixer (1) relative to the fan (2).